REMARKS/ARGUMENTS

This application has been reviewed in light of the Office Action dated July 13, 2005. Claims 23 and 24, which are independent claims, are pending. Claims 1-14 and 16-22 have been cancelled by this amendment, without prejudice or disclaimer of the subject matter presented therein. Claims 23 and 24 have been added by this amendment to provide Applicants with a more complete scope of protection. Favorable reconsideration is requested.

The Office Action includes an objection to FIGS. 9 and 24 as including reference numerals not mentioned in the description or not including reference numerals mentioned in the description. See paragraphs 1 and 2 of the Office Action. Applicants submit herewith replacement sheets of FIGS. 9 and 24, which include all reference numerals described with regard to these figures in the specification and have amended the specification to refer to all reference numerals included in these figures. In particular, FIG. 9 has been amended to include reference numerals 910, 920, 930, 940, 950, 960, and 970, and the specification has been amended to refer to these reference numerals. FIG. 24 has been amended to include reference numerals 241-247, and the specification has been amended to refer to these reference numerals. Applicants respectfully submit that no new matter has been added by these replacement figures and amendments. Applicants further submit that these replacement figures and amendments obviate the objections to the drawings and, accordingly, withdrawal of the objections is respectfully requested.

Claims 1-6, 9-14, and 16-22 were rejected under 35 U.S.C. §103(a) as allegedly unpatentable over U.S. Patent No. 5,745,249 (Crean et al.), in view of U.S. Patent No. 5,886,797 (Shimura). Claims 7 and 8 were rejected under §103(a) as allegedly unpatentable over Crean in view of Shimura and further in view of U.S. Patent No. 5,200,831 (Tai). Although Claims 1-14 and 16-22 have been cancelled, Applicants respectfully traverse these rejections and submit that newly added independent Claims 23 and 24 are patentably distinct from the cited references, taken separately or in any proper combination, for at least the following reasons.

According to an embodiment of the present invention, as illustrated in FIG. 1, rasterized, color-separated, gray-level image data (referred to in this Amendment as an "input image") is input into the system 10 via a one-

dimensional look-up table or global color process control unit 12. See at least page 5, lines 17-27 of the specification. The unit 12 allows an operator to perform last minute adjustments to the input image. See at least page 5, lines 22-27.

The input image (adjusted or not) is then subjected to gray-level halftoning by at least two halftone screens in parallel, e.g., "screener 1" 18 and "screener 2" 20 in FIG. 1. See at least page 6, lines 6-13. Each halftone screen may be configured to operate on a certain type of image, such as a primarily text-based image or a graphics-based image. See at least page 6, lines 13-27. The output of each gray-level halftoning process is halftone data representing a density of each of a plurality of microdots (also known as "image-setter spots" or "printed dots"), where each microdot can be associated with a plurality of densities. For example, the output of either "screener 1" 18 or "screener 2" 20, could appear as follows:

8	15
1	8

where each cell in the above figure represents a single microdot, and the number in each cell represents the density of that microdot.

Gray-level halftoning, such as that performed by "screener 1" 18 and "screener 2" 20 is compatible with gray-level printing, i.e., printing from printers capable of printing a solid microdot having different sizes. For example, a 4-bit gray-level printer is capable of printing a microdot having 16 different sizes. With reference to the above figure, the microdots having a density of 8 may result in a medium-sized printed dot, the microdot having a density of 15 may result in a large-sized printed dot, and the microdot having a density of 1 may result in a small-sized printed dot. See at least page 6, lines 28-31.

In contrast to gray-level halftoning, binary halftoning generates halftone data representing a density of each of a plurality of microdots, where each microdot can be associated with only two density levels, full density or no density.

Contemporaneously with the halftoning performed by the "screener 1" 18 and the "screener 2" 20, an adaptive screen analyzer 14, in combination with a blending coefficient look-up table 16, determine blending

coefficients BC1 and BC2. If "screener 1" 18 and "screener 2" 20 pertain to text and graphics images (or vice versa), respectively, the blending coefficients may be used to specify generally what percentage of the input image is deemed to pertain to text versus graphics. See at least page 5, line 27 to page 6, line 5. Of course, other types of halftone screens may be used, and, accordingly, the blending coefficients may be used to specify what percentage of the input image has some other characteristic besides pertinent to text versus graphics.

A blending operation 24 is performed to blend the halftone data output by each of the screeners 18 and 20 using blending coefficients BC1 and BC2. See at least page 6, lines 13-27. An advantage of this blending operation is that it weights the halftone data output from one of the screeners 18 and 20 more than the other if it has been determined that the input image was primarily text or graphics, for example, as identified by the blending coefficients BC1 and BC2. See at least page 6, lines 13-27.

An embodiment of the present invention further refines the image by performing gray-level anti-aliasing, a form of edge enhancement, to portions of the blended halftone data deemed to pertain to text or high-contrast-edges. See at least page 7, line 14 to page 8, line 14.

Although the claims are not limited to the details of the embodiments discussed above, which are referred to for purposes of illustration only, the cited passages of the specification provide support for newly added independent claims 23 and 24. With regard to Claim 23, a method for processing input image data is recited. According to the method, image data is received that includes data representing a plurality of pixels, wherein each pixel of the plurality of pixels is associated with a location and one of at least three intensities. The method also includes accessing a memory storing data representing a halftone screen, the halftone screen including a plurality of halftone planes, each halftone plane of the plurality of halftone planes including a plurality of cells, wherein each cell of the plurality of cells is associated with one of at least three microdot densities, the microdot densities being representative of a particular dot size capable of being printed by a gray-level printer. For each pixel ("current pixel"), the intensity and location of the current pixel is determined, one of the plurality of halftone planes is selected based at least upon the current pixel's intensity, and

one of the microdot densities in the selected halftone plane is associated with the current pixel based at least upon the current pixel's location.

Additionally, the method requires outputting the microdot densities associated with the plurality of pixels as first gray-level halftone data, and blending the first gray-level halftone data with second gray-level halftone data resulting in blended-gray-level halftone data. The blending step weights the first gray-level halftone data and the second gray-level halftone data depending upon characteristics of the image data. Further, the method requires performing edge enhancement on portions of the blended-gray-level halftone data that include text or high-contrast-edge data resulting in enhanced-blended-gray-level halftone data, and outputting the enhanced-blended-gray-level halftone data.

Notable features of Claim 23 include the halftone screen that includes a plurality of halftone planes, each halftone plane including a plurality of cells, wherein each cell is associated with one of at least three microdot densities. One of the plurality of planes are selected for a pixel based at least upon the pixel's intensity, and a microdot density within that selected plane is associated with the pixel based at least upon its location. Support for these features can be found in the specification at least at page 12, lines 29-31 and page 13, lines 1-4. An advantage of these features is that they provide a high degree of control regarding how a printed image will appear, because each pixel may be associated with different microdot densities depending upon the pixel's intensity and its location within an image. For instance, a pixel having an intensity of 50 may be associated with a different microdot density (or densities) if its coordinate location is (1,1) or (1,2). Further, a pixel having an intensity of 50 at location (1,1) may be associated with a different microdot density (or densities) if its intensity is not 50.

In contrast to these features, the Crean et al. patent is understood to pertain to binary halftoning, and, consequently, its halftone screens are not understood to contain a plurality of halftone planes, as required by Claim 23. See col. 5, lines 9-22. The Office Action cites col. 6, lines 9-21 of the Crean et al. patent as allegedly disclosing a plurality of halftoning planes. However, Applicants understand this passage to describe that the approach described in the Crean et al. patent is efficient when the number of binary microdots in a halftone cell approaches the number of intensities that any one pixel is capable of having.

To elaborate, in binary printing, as opposed to gray-level printing, each microdot has two density levels: on or off. A binary halftone cell includes a plurality of microdots, such as the halftone cell (including four microdots) shown below:

1	1
0	0

The number of "levels" capable of being displayed by a binary halftone cell is equivalent to the number of microdots in its cell. For example, if a halftone cell includes four microdots, such as the one shown above, the halftone cell is capable of displaying 5 "levels": a first level where none of the four microdots are printed, a second level where one of the four microdots are printed, etc.

If the halftone cell cannot display all of the intensity values that the input pixel can, mapping of pixel intensities to halftone levels occurs. For instance, if a 4-bit pixel capable of having 16 intensity levels is binary halftoned by a screen having 4 microdots per halftone cell, pixel intensity 0 may be mapped to halftone level 0 (i.e., no microdots are printed in the cell), pixel intensities 1-3 may be mapped to halftone level 1 (i.e., one microdot out of four is printed), pixel intensities 4-7 may be mapped to halftone level 2 (i.e., two microdots out of four are printed), etc. The Crean et al. patent is understood to state that the described approach is efficient when the number of halftone levels available to each halftone cell approaches the number of pixel intensities available to each of the input pixels.

In contrast to the Crean et al. patent, Claim 23 requires a halftone screen that includes a plurality of halftone planes, such that one of the planes is selected based at least upon an intensity of a current pixel and a microdot density from the selected plane is associated with the current pixel based at least upon the current pixel's location. The "levels" referred to at column 6, lines 9-11 of the Crean et al. patent are believed to pertain to the levels displayable by a halftone cell and not a halftone screen including a plurality of halftone planes.

Another notable feature of Claim 23 is the outputting of the microdot densities associated with the plurality of pixels as first gray-level halftone data. Claim 23 also recites that the microdot densities are representative of a particular dot size capable of being printed by a gray-level printer. Col. 4,

lines 44-48 was referred to previously by the Office Action dated August 6, 2004 as allegedly showing that the Crean et al. patent pertains to gray-level halftoning. This portion of the Crean et al. patent states, "The process of 'halftoning' uses binary (e.g., color/no-color, black/white) pixels printed in patters that, when viewed by the human eye at appropriate distances, are integrated by the human vision system to appear as gray levels." To maintain consistent terminology, Applicants note that the term "pixels" in this portion of the Crean et al. patent is understood to refer to microdots as used in the present application and this Amendment. Applicants understand this portion of the Crean et al. patent to describe that microdots having only two density levels (on or off) are printed in patters, such that the human visual system combines them and sees them as gray levels. However, the printed microdots themselves are either printed (as one size) or not printed. Accordingly, this binary halftoning is compatible with binary printers capable of printing a single dot size. In contrast, gray-level halftoning is compatible with gray-level printers capable of printing a plurality of microdot sizes. As such, gray-level halftoning specifies one of more than two density levels for each microdot. See page 6, lines 28-31 of the specification of the present application.

Applicants note that col. 8, line 66 to col. 9, line 7 of the Crean et al. patent discusses accomplishing "finer edge placement using added resolution normally employed for adding levels to a halftone dot." Applicants understand this portion of the Crean et al. patent to describe adding more "levels," as described above, to a halftone cell. In other words, more microdots are added to a halftone cell to increase the number of "levels" that the halftone cell can display. However, Applicants understand that the microdots themselves are still binary in that they have only two density levels, on or off. In contrast, gray-level halftoning produces data specifying one of more than two density levels for each microdot.

For at least the above reasons, Applicants respectfully submit that the Crean et al. patent pertains to binary halftoning and not gray-level halftoning, to which Claim 23 pertains.

Another notable feature of Claim 23 is the blending of the first gray-level halftone data with the second gray-level halftone data, wherein the blending weights the first gray-level halftone data and the second-gray-level data

depending upon characteristics of the image data. Applicants note that Claim 23 has a temporal requirement in that the recited gray-level halftone data is generated prior to blending. The Office Action at page 8 refers to col. 9, lines 42-55 and FIG. 10 of the Crean et al. patent as allegedly teaching blending rendered values from the halftoning process via at least one additional halftoning process. The cited portion of the Crean et al. patent is understood to disclose either performing normal halftoning or performing resolution enhancement in lieu of normal halftoning. See col. 9, lines 31-36 (some memory block address ranges are dedicated to normal halftone generation and others for enhancement codes) and col. 9, lines 23-30 (enhancement tags are used as a replacement for the pixel portion of the memory block address). The memory referred to by the Crean et al. patent is understood to include the information needed to halftone or enhance a pixel. (See col. 7, lines 37-38 stating that the "coding in memory 50 also contains all combinations of thresholds for a given input pixel.") Accordingly, the Crean et al. patent is understood to optionally have portions of the memory 50 allocated for normal halftoning and other portions for enhancement. The address sent to the memory may include either tags or codes used to identify when enhancement or normal halftoning should occur. Applicants respectfully submit, however, that the recited sequence of halftoning and then blending required by Claim 23, is not taught or suggested by the Crean et al. patent. Further, Applicants respectfully submit that the Crean et al. patent does not teach or suggest that the blending weights the first gray-level halftone data and the second-gray-level data depending upon characteristics of the image data, as required by Claim 23.

Relevant to this point, Applicants note that the Crean et al. patent at col. 9, line 42 describes a "pre-filtering" step. This pre-filtering step is understood to pertain to reviewing the image data to determine which parts of the image data should be enhanced which way (in order to determine which enhancement code should be set for that pixel region). Subsequently, the enhancement code (located in the memory address) is understood to be used to perform the identified enhancement (in lieu of normal halftoning). Applicants respectfully submit that reviewing an image to determine what type of enhancement should be performed, if any, is not the outputting of gray-level halftone data, as required by Claim 23. Accordingly, Applicants respectfully

submit that this portion of the Crean et al. patent also does not teach or suggest the sequence of halftoning and then blending required by Claim 23.

Yet another notable feature of Claim 23 is the performing of edge enhancement on portions of the blended-gray-level halftone data that include text or high-contrast data. Applicants acknowledge that edge enhancement, in and of itself, is not new, but Applicants submit that the combination of the recited edge enhancement with the other steps recited in Claim 23 is new. In particular, the recited sequence of steps in Claim 23 of halftoning, blending, and performing edge enhancement produces superior image quality. The blending step allows two different sets of gray-level halftone data to be blended depending upon characteristics of the image data, followed by edge enhancement of the portions of the blended-gray-level halftone data that include text or high contrast data. See page 7, line 14 to page 8, line 14 of the specification, which describes the benefits of providing anti-aliasing of non-saturated text, reducing moiré, and providing anti-aliasing of saturated text. (It should be noted that the scope of Claim 23 is not limited to the details of this embodiment, however, which is referred to for illustration purposes only.) Applicants respectfully submit that the Crean et al. patent does not teach or suggest this sequence of steps. In particular, the Crean et al. patent is not understood to pertain to gray-level halftoning, let alone blending two sets of gray-level halftone data followed by performing edge enhancement on portions of the blended-gray-level halftone data.

For at least the reasons discussed above, Applicants respectfully submit that Claim 23 is patentable over the Crean et al. patent. In addition, none of the other cited references are believed to teach or suggest, either alone or in any proper combination, all of the features of Claim 23, and, accordingly, Applicants respectfully submit that Claim 23 is patentable over them as well.
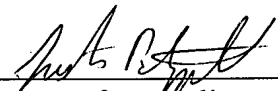
Independent Claim 24 is an apparatus claim that corresponds to method Claim 23, and is believed to be patentable for at least the same reasons as discussed above.

This Amendment After Final Action is believed to place this application in condition for allowance and, therefore, its entry is believed proper under 37 C.F.R. §1.116. Accordingly, entry of this Amendment After Final Action, as an earnest effort to advance prosecution and reduce the number of issues, is respectfully requested. Should the Examiner believe that issues remain

outstanding, it is respectfully requested that the Examiner contact Applicants' undersigned attorney in an effort to resolve such issues and advance the case to issue.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration, withdrawal of the outstanding rejections, and the allowance of the present application.

Respectfully submitted,

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